REMARKS/ARGUMENTS

Introduction

Applicants have now had an opportunity to carefully consider the Examiner's comments set forth in the Office Action of February 24, 2005. As set forth more fully below, reconsideration of the application is respectfully requested.

Claims 1, 3-12, 14, 15, 17, 19, 20 and 22-29 remain in this application. Claims 2, 13, 16, 18, 21 and 30 have been canceled. Claims 1, 11-12, 14-15, 17, 19, 20, 22-23, and 27-29 have been amended.

Summary of the Office Action

a. Claims 1, 3, 6-8, 9-13, and 29-30 were rejected under the judicially created doctrine of obviousness-type double patenting in view of co-pending Application Nos. 09/965,880, 10/040,692, and 10/040,693.

b. Claim 11 was rejected under 35 U.S.C. 112 as being indefinite.

c. Claims 1-3, 6-7, 12-14 were rejected under 35 U.S.C. 102(b) as being anticipated by Schettini et al.

d. Claims 4-5 were rejected under 35 U.S.C. 103(a) as being unpatentable over Schettini.

e. Claims 8-11 were rejected under 35 U.S.C. 103(a) as being unpatentable over Schettini in view of Shafarenko et al.

f. Claims 15-18 and 21-26 were rejected under 35 U.S.C. 103(a) as being unpatentable over Schettini in view of Hartman et al.

g. Claims 19-20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Schettini in view of Hartman et al. as applied to claims 15-17 and further in view of Shafarenko et al.

h. Claim 29 was rejected under 35 U.S.C. 103(a) as being unpatentable over Schettini in view of Revankar et al.

i. Claims 27-28 are directed to allowable subject matter.

A. The Provisional Obviousness-Type Double Patenting Rejections

Claim 1 stands provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claim 1 of co-pending application 09/965,880. Claims 6-8 stand provisionally rejected under the judicially created

doctrine of obviousness-type double patenting over claims 1-2 and 6 of co-pending application 10/040,692. Claims 9-11 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claim 7 of co-pending application 10/040,692 in view of Schettini et al. Claim 12 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-2 of co-pending application 10/040,693. Claim 29 stands provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claim 16 of co-pending application 10/040,693.

These rejections, however, should be withdrawn for at least the reason that a terminal disclaimer, pursuant to 37 CFR 1.130(b), has been submitted herewith, rendering these rejections moot.

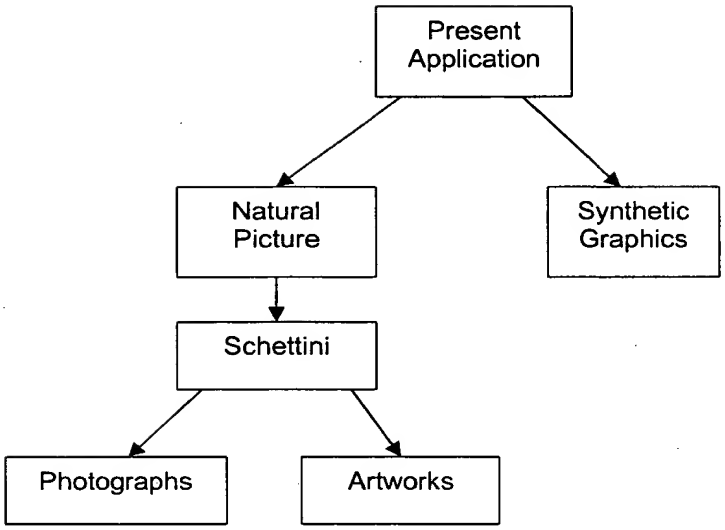
B. The Rejection of Claim 11 Based on 35 U.S.C. 112

Claim 11 has been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection should be withdrawn for at least the reason that the subject claim has been amended to cure the indefiniteness indicated by the Examiner.

C. The Rejection of Claims 1, 3, 6-7, 12, and 14 As Being Anticipated by Schettini et al.

This rejection should be withdrawn for at least the reason that Schettini et al. does not teach or suggest each and every element as set forth in the subject claims.

There are at least several differences between the embodiments disclosed in the present application and the prior art cited by the Examiner. For instance, Schettini distinguishes photographs from artworks. Artworks are the images that are created by human beings, *e.g.*, oil paintings. The present application, on the other hand, classifies synthetic graphics (computer generated images) from natural pictures (non-computer generated images). The latter includes both photographs and artworks as illustrated below:



Additionally, embodiments of the present application are directed to SGLD variance, bias, skewness, and fitness, while Schettini is directed to NGTDM coarseness, contrast, busyness, complexity, and strength. The statistical features used by Schettini were explicitly listed. They are coarseness, contrast, busyness, complexity, and strength. The list did not include variance, bias, skewness, and fitness, which are used in the present application.

Further, many of the claimed features are not taught or suggested by the cited prior art. For example, independent claims 1 and 6 of the present application teach extracting at least one feature from an input image, such as color discreteness features, while Schettini discloses extracting the Color Coherence Vectors (or CCV) from an image. These are entirely different concepts. Color discreteness measures whether the colors used in the image are continuous or discrete in *color space*, while CCV measures whether the pixels are different from their neighboring (in *spatial space*) pixels in color. Color discreteness is independent of the geometrical distribution of pixels, while CCV measures such kind of distribution.

To illustrate further, for an image that contains only black and white colors, the color discreteness measure is always 1, regardless of the distribution of black and white pixels. However, depending on the distribution of the pixels, the CCV of a black and white image can be any of the following:

1) black incoherent, white coherent (a few black pixels on a white background);
2) white incoherent, black coherent (a few white pixels on a black background);
3) both black and white coherent (*e.g.* left half of the image black and right half white);
4) both black and white incoherent (*e.g.* black and white pixels mixed with each other);
5) some of the black pixels are coherent, and some are incoherent (a mixture of Nos. 1 and 2 above); or
6) some of the white pixels are coherent, and some are incoherent (a mixture of Nos. 1 and 2 above).

Accordingly, for at least these reasons, claim 1 as well as claim 6 and claims 7-11, which depend therefrom, are not anticipated by Schettini.

Further, independent claims 1 and 12 teach extracting one or more edge features E from the input image, processing the edge orientation feature using an associated algorithm, comparing the result with one or more thresholds, and classifying the image as one of a picture and a graphic or indicating the result is indeterminate (the image cannot be classified as a picture or graphic). Schettini et al. does not teach or suggest such claimed aspects. Rather, Schettiini teaches edge direction distribution. Edge feature E measures the *average length* of the edges, while the edge direction distribution measures the edge *direction distribution*.

Accordingly, for at least these reasons, claim 1 as well as claim 12 and claim 14, which depends therefrom, are not anticipated by Schettini.

Additionally, independent claims 3, 6 and 12 recite extracting one or more features from the input image, processing each extracted feature using an algorithm associated with the feature, comparing the result of each feature algorithm to one or more previously selected thresholds, and if, according to previously determined rules, any comparison is determinative of the class of the input image, classifying the input image in either the natural picture or synthetic graphics class according to the previously determined rules, otherwise indicating the result is indeterminate.

Schettini, however, teaches a classification technique that classifies based on minimizing cost of misclassification. With this technique, a classification tree is

constructed through training sets of known classes (images known to be photographs and artworks). (See Schettini, Tree Classifiers, p. 269, col. 2, ¶2). Once the tree is constructed, each terminating node is assigned a class. (See Schettini Tree Classifiers, p. 269, col. 2, ¶2). When a new image is processed, it moves through the tree to a terminating node and is classified as the class associated with that terminating node. Such classification represents the lowest probability of misclassification, or minimized expected cost of misclassification. (See Schettini, Tree Classifiers, p. 269, col. 2, ¶2).

In the subject Office Action, it is asserted that Schettini et al. teaches classifying the image as one of a picture and a graphic or indicating the result is indeterminate. Contrary to this assertion, Schettini does not teach or suggest indicating a result is indeterminate. Rather, Schettini teaches classifying an input image into a predefined class (a photograph or an artwork) depending on which classification minimizes expected cost. Schettini discloses that a disadvantage with this technique is that it must classify the input into one of the predefined classes, even where the input image does not belong to any of the classes. (See Schettini, Conclusions, p.217, col. 2, ¶1). For instance, an input image that does not belong to any of the predefined classes is still classified as belonging to one of the predefined classes. The input image is simply associated with the class that minimizes the misclassification, even though the classification is incorrect. In contrast, the subject claim recites indicating the result is indeterminate when the comparison is non determinative of a class (does not belong to a class). Thus, unlike Schettini, the subject claim contemplates situations where the input image does not belong to a recognizable class.

Accordingly, claim 3 and claims 4-5, which depend therefrom, claim 6 and claims 7-11, which depend therefrom, and claim 12 and claim 14, which depends therefrom, are not anticipated by Schettini.

D. <u>The Rejection of Claims 4-5 As Being Obvious Over Schettini</u>

Claims 4 and 5 depend from claim 3. Claim 3 recites classifying the input image in either the natural picture or synthetic graphics class according to the previously determined rules, otherwise indicating the result is indeterminate. The Examiner asserts Schettini teaches such aspects. As noted above, however, Schettini teaches a technique that must classify the input as a predefined class,

even where the input image does not belong to any of the predefined classes. (See Schettini, Conclusions, p.217, col. 2, ¶1). Therefore, Schettini does not generate indeterminate results and, therefore, does not teach or suggest performing additional classification. As such, claims 4 and 5 are not obvious over Schettini.

E. The Rejection of Claims 8-11 As Being Obvious Over Schettini in View of Shafarenko

Claims 8-11 depend from claim 6, which recites "extracting one or more color discreteness features from the input image" and claim 7, which recites "transforming the input image to a color space," "processing the input image using a low-pass filter," and "extracting one or more color discreteness features from the transformed image." Claim 8 then adds the feature that the color space is a CIELUV color space. Claims 9-11, in turn, adds the steps of computing a histogram and normalizing the histogram.

Thus, the calculation of color discreteness includes these steps:

1) color space transformation;
2) low-pass filtering;
3) computing a histogram;
4) normalizing the histogram; and
5) extracting color discreteness (Eq. 10-12 in the application).

Schettini and Shafarenko, however, teach only the first four steps. They do not teach the last step – extracting color discreteness.

To explain further, for each color channel, the color discreteness is a scalar feature, while the color histogram is an N-dimension vector feature, where N is the size of the histogram. For example:

For a black and white image, the color discreteness (R_L) is always 1, regardless of the ratio between the black pixels and white pixels, while the color histogram (L channel) varies for different black/white ratio. It could be any of the following:

(1, 0, 0, ...,0)	(all black)
(0.9, 0, 0, ...0, 0, 0.1)	(90 % black, 10 % white)
(0.8, 0, 0, ...0, 0, 0.2)	(80 % black, 20 % white)
...	

(0, 0, 0, ...0, 0, 1) (all white)

Thus, for at least these reasons, claims 8-11 are not obvious over Schettini in view of Shafarenko.

F. The Rejection of Claims 15, 17, and 22-26 As Being Obvious Over Schettini in View of Hartman

Claim 15 recites extracting features such as SGLD texture, color discreteness and edge features from the input image. As explained above, the cited art does not teach such steps. Additionally, claim 17 is directed to SGLD variance, bias, skewness, and fitness, while Schettini is directed to NGTDM coarseness, contrast, busyness, complexity, and strength. The statistical features used by Schettini were explicitly listed. They are coarseness, contrast, busyness, complexity, and strength. The list did not include variance, bias, skewness, and fitness, which are used in the present application.

Accordingly, claim 15 and claims 17 and 22-26, which depend therefrom, are not obvious over Schettini in view of Hartman.

G. The Rejection of Claims 19-20 As Being Obvious Over Schettini in view of Hartman as Applied to Claims 15-17 and Further in View of Shafarenko

Again, claim 15 recites extracting features such as SGLD texture, color discreteness and edge features from the input image. As explained above, Schettini does not teach such steps. Shafarenko does not cure this deficiency. As such, claims 19-20 are not obvious over Schettini in view of Hartman and further in view of Shafarenko.

H. The Rejection of Claim 29 As Being Obvious Over Schettini in View of Revankar

The Examiner has rejected claim 29 as being unpatentable over Schettini in view of Revankar. This rejection should be withdrawn for at least the reason that Schettini and Revankar, alone and in combination, do not teach or suggest all limitations of the subject claims.

Independent claim 16 recites a classifier that classifies an input image as a natural picture or a synthetics graphic and a switch for routing the classified image

for processing by a picture processing module or a graphic processing module based on the classification of the input image. The Examiner concedes that Schettini does not teach or suggest such aspect and contends that Revankar makes up for these deficiencies. Applicants, however, respectfully disagree.

Schettini is directed to distinguishing photographs from artwork based on minimizing expected cost of misclassification. Schettini discloses a classification tree where each terminating node is assigned a class. (See Schettini, Tree Classifiers, p. 269, col. 2, ¶2). When a new image is processed, the class associated with the terminating node that the image falls into is deemed the class of the image. (See Schettini, Tree Classifiers, p. 269, col. 2, ¶2). This class represents the class that minimizes the expected cost of misclassification. In contrast, Revankar is directed towards enhancing image rendering (printing and copying). (See Revankar, col. 8, ll. 48-67). Revankar discloses a rendering technique where a document image is segmented into regions and respective regions are rendered using different rendering techniques to produce an output image that is more desirable than the input image. (See Revankar, col. 8, ll. 48-67). Thus, Revankar teaches outputting an improved image by rendering disparate regions of an input image with different rendering techniques, whereas Schettini teaches classifying an input image as a photograph or artwork based on minimizing an expected cost of misclassification.

At the time of the invention, one of ordinary skill in the art of classifying an image as a photograph or a graphic based on minimizing expected cost of misclassification would not look to the art of improving image printing to determine whether an input image is a picture or a graphic or to route the classified image for processing by a picture processing module or a graphic processing module as recited in the subject claim. Furthermore, there is no teaching, motivation, suggestion or desirability in either reference to combine the references or modify Schettini in view of Revankar to render the subject claims. The cited references are directed to disparate applications - classification based on minimizing misclassification cost and improving image rendering quality. Moreover, even if the references could be combined, the purported combination would not teach or suggest the subject claims as combining a classifier that classifies input images as a photograph or artwork as a function of misclassification cost with a system that segments an input image to improve printing quality does not teach or suggest

routing an input image classified as a picture or graphic image to a picture processing module or a graphic processing module for processing.

Since the combination of Schettini and Revankar does not teach or suggest all the limitations of the subject claim, the rejection of independent claim 29 should be withdrawn.

I. Claims 27-28 Are Directed to Allowable Subject Matter

It is noted with appreciation that the Examiner has indicated that Claims 27 and 28 are directed to allowable subject matter. Accordingly, claims 27 and 28 have been rewritten in independent form, including the limitations of the base claim and any intervening claims. For at least these reasons, they are now allowable as amended.

CONCLUSION

For at least the reasons detailed above, it is submitted that all claims remaining in the application (Claims 1, 3-12, 14, 15, 17, 19, 20 and 22-29) are now in condition for allowance. The foregoing comments do not require any unnecessary or additional search or examination.

The undersigned attorney of record hereby authorizes the charging of any necessary fees, other than the issue fee, to Xerox Deposit Account No. 24-0037.

In the event the Examiner considers personal contact advantageous to the disposition of this case, he/she is hereby authorized to call John Zanghi, at Telephone Number (216) 861-5582.

Respectfully submitted,

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4/29/05
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